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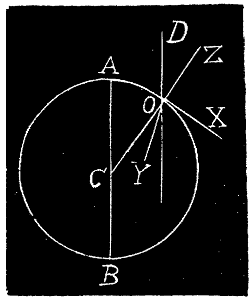
OZ, and β cosϕ about OX. The former does not alter the position of OC, while the latter turns OC in a time t through an angle β cosϕt. Hence the body is acted upon by a westerly component, due to the change of direction of gravity, $=g\sin(\beta\cos\phi t)=g\,\beta\cos\phi t$, since βt is small. Now let y be the distance the body is in space from the plane XZ at the moment the body begins to fall, and then the equation of motion of the body in space is $\frac{d^2y}{dt^2}=g\,\beta\,t\cos\phi$. Integrating this, and remembering that, as explained above, $\frac{dy}{dt}=-\beta H\cos\phi$, we get $y=-\beta Ht\cos\phi+\frac{1}{6}g\beta t^3\cos\phi$. $\therefore$ $E_d=\beta\,t\cos\phi(H-\frac{1}{6}gt^2)$. But $\frac{1}{2}gt^2=H+\Delta$ and the centrifugal force at the equator$=\beta^2r=\frac{4\pi^2r}{T^2}$, where r=radius of the earth.



$$\therefore\quad \beta^2=\frac{4\pi^2}{T^2}\text{ and }\beta=\frac{2\pi}{T}.\text{ Substituting we get}$$

$$E_d=\frac{2\pi t\cos\phi}{T}\left\{H-\tfrac{1}{3}(H+\Delta)\right\}=\frac{2\pi t\cos\phi}{T}(\tfrac{2}{3}H-\tfrac{1}{3}\Delta)$$

$$=\frac{2\pi t\cos\phi}{3T}(2H-\Delta)=\frac{4\pi t(H-\frac{1}{2}\Delta)\cos\phi}{3T}.$$

[NOTE.—No solution has yet been received to problem 17. EDITOR.]

PROBLEMS.

24. Proposed by Professor J. F. W. SCHEFFER, A. M., Hagerstown, Maryland.

A sphere whose center of gravity does not coincide with its geometrical center is placed on a rough inclined plane. State under what circumstances the sphere will slide without rolling, roll without sliding, and neither roll nor slide.

25. Proposed by Professor GEORGE LILLEY, LL. D., Ex-President of Washington State Agricultural College and School of Science, Portland, Oregon.

It is known that if the velocity of a certain freight train is 30 miles an hour it can be brought to a stand still in a distance of 500 feet by setting the brakes. It was stopped in 1200 feet by setting the brakes. Find its velocity, the forces exerted by the brakes being the same in each case.